

# INFORMATION FOR TECHNICAL REVIEW—GAS TURBINES

## Guidance for Permit Applicants

The following information will be used for the technical review of a Permit to Install application for a **gas turbine**. This information is in addition to the general requirements outlined in the AQD document “Information for an Administratively Complete Permit to Install Application,” Part 2 - Additional Supporting Information, Items A through F. Please note that all the information may not be needed for each application, nor is this document necessarily all inclusive. Additional information beyond what is identified in this guidance may be necessary to complete the technical review of any individual application. In the event a determination is made that new additional information is needed for all technical reviews, this document will be updated.

All referenced guidance documents are available on the Air Quality Division (AQD) website at [AQD Permits to Install / New Source Review](#) or you may contact the Permit Section at 517-284-6802.

### A. Process Description

1. Describe each gas turbine by identifying the type (simple, combined, or regenerative cycle), and intended use (base load, emergency, or peaking).
2. Provide the maximum heat input based on the lower heating value of the fuel, in million Btu per hour, at ISO conditions (288°K, 60% relative humidity, and 101.3 kilopascals pressure).
3. Describe the proposed fuels to be fired including the lower heating value and maximum percent sulfur content, if other than natural gas.
4. Provide the maximum and expected fuel firing rate for each fuel, on an hourly and annual basis, at various ambient temperatures (-20°F, 0°F, 30°F, 50°F, 60°F, and 100°F).
5. Provide the manufacturer specific thermal efficiency in kilojoules per watt-hour.
6. If the turbine(s) is a combined cycle, describe the waste heat recovery boiler including the following:
  - a) The proposed fuels to be fired including lower heating value and maximum percent sulfur content, if other than natural gas.
  - b) The maximum heat input based on the lower heating value of the fuel, in million Btu per hour.
7. Describe how continuous compliance with the emission limits will be documented (continuous emissions monitor, parametric monitoring).

### B. Regulatory Discussion

The following state air pollution control regulations may be applicable. Please review these regulations carefully to determine if they apply to your process and summarize the results in the application. The [Air Pollution Control Rules](#) may be viewed from the [AQD website](#). Click on “State Air Laws and Rules.”

1. State of Michigan, Department of Environment, Great Lakes, and Energy, Act 451 of 1994, Natural Resources and Environmental Protection Act, Part 55 Air Pollution Control and the following promulgated rules:
  - a) Rules 215 and 216 apply to an existing facility which has a current Renewable Operating Permit (ROP). A Permit to Install issued for the installation of new equipment or modifications to existing equipment is incorporated into an ROP pursuant to Rules 215 and 216.
  - b) Rules 1901 - 1908 apply to a major source and/or a major modification at a source which is located in a nonattainment area. A nonattainment area is one where the National Ambient Air Quality Standards (NAAQS) are not being met. These rules require compliance with the lowest achievable emission rate (LAER) and an emission reduction (offset) for each nonattainment air contaminant emitted in significant quantities as defined by Rule 119(e). However, a source may choose to “net out” of the requirements of these rules. For additional detailed information regarding “netting”, refer to Chapter 5 of the document entitled “PSD

Workbook: A Practical Guide to Michigan's Prevention of Significant Deterioration Regulations", May 2014. This guide is referred to as the AQD's PSD Workbook and can be found on the [Permits to Install \(PTI\) / New Source Review \(NSR\)](#) webpage. Click on 'Application Form Instructions & Guidance Documents'. Although the guidance document is in regard to Michigan's PSD regulations, the netting analysis performed for nonattainment NSR is the same as that performed for PSD.

- c) Rules 1801 – 1823 apply to a major source and/or a major modification at a source which is located in an attainment area. An attainment area is one where the NAAQS are being met. These rules require compliance with Best Available Control Technology (BACT) and a demonstration that the proposed emissions will not contribute to the deterioration of air quality and will not violate any NAAQS or Prevention of Significant Deterioration (PSD) increment. Refer to the [AQD's PSD Workbook](#) for additional detailed information. However, a source may choose to "net out" of the requirements of the PSD rules. For additional detailed information regarding "netting," refer to Chapter 5 of the [AQD's PSD Workbook](#) for additional detailed information.
- d) If the process or equipment was installed or modified after April 17, 1992, Rules 224 – 230 apply. Rule 224 requires the application of Best Available Control Technology for toxics (T-BACT) for all non-volatile organic compound (VOC) toxic air contaminants (TACs). T-BACT does not apply to emissions of VOCs. Rule 225 limits the emission impacts of TACs and requires a demonstration that the proposed emission of each TAC complies with a health-based screening level. Compliance can be demonstrated using any of three methods described in Rule 227(1) including the use of computerized dispersion modeling. Refer to "Guidelines for Conducting a Rule 224 T-BACT Analysis," "TACs-Demonstrating Compliance with Rule 225," and "Dispersion Modeling Guidance" for additional detailed information.
- e) Rule 301 specifies a process or process equipment shall not discharge visible emissions of a density greater than the most stringent of a 6-minute average of 20% opacity, or a limit specified by an applicable federal NSPS or as a condition of a Permit to Install.
- f) If the process or equipment was installed or modified after August 1, 1979, Rule 702 applies. This rule requires Best Available Control Technology (BACT) for new sources of VOCs. Refer to "Instructions for Conducting a BACT Analysis" for additional detailed information.
- g) Part 8 Rules specify the emission limitations and prohibitions for oxides of nitrogen (NO<sub>x</sub>)
- h) Rule 901 prohibits emissions of an air contaminant in quantities that cause either a) injurious effects to human health or safety, animal life, plant life of significant economic value, or property; or b) unreasonable interference with the comfortable enjoyment of life and property. Submit the following to address this rule:

*A detailed description of the procedures and the methods used to ensure that the necessary temperature in the combustion zone, when burning fuels other than, natural gas, propane, Nos. 1-6 fuel oil, wood or coal, is achieved and maintained during turbine start-up and shutdown and during periods when high moisture/low BTU waste is charged into the turbine. Include the type of auxiliary fuel and the maximum auxiliary fuel firing rate used for start-up. Provide all supporting assumptions, calculations, and other documentation.*

2. The PSD increments (40 CFR 52.21 (c)) and the NAAQS (40 CFR 52.21(d)) apply to all sources throughout the United States, regardless of size. Compliance with these air quality standards can be demonstrated using computerized dispersion modeling. An applicant for a PSD permit is required to submit PSD increment modeling for PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub> and NO<sub>x</sub>, and NAAQS modeling for PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>, NO<sub>x</sub>, CO, Ozone, and Lead as part of the application. Modeling for sources not subject to PSD may be done by the AQD. Refer to "Guidelines for Dispersion Modeling" for additional detailed information.
3. Federal Standards of Performance for New Stationary Sources (NSPS), 40 CFR Part 60;
  - a) Subpart D, Fossil Fuel-Fired Steam Generators with a heat input capacity greater than 250 MMBtu per hour.
  - b) Subpart Da, Electric Utility Steam Generating Units with a heat input capacity greater than 250 MMBtu per hour.
  - c) Subpart Db, Industrial-Commercial Institutional Steam Generating Units with a heat input capacity between 100 and 250 MMBtu per hour.

- d) Subpart Dc, Small Industrial-Commercial Institutional Steam Generating Units with a heat input capacity between 10 and 100 MMBtu per hour.
- e) Subpart GG, Standards of Performance for Stationary Gas Turbines.

These regulations are available on the United States Environmental Protection Agency (USEPA) Website at [New Source Performance Standards](#). These regulations should be consulted carefully to determine applicability to your process.

- 4. National Emission Standards for Hazardous Air Pollutants (NESHAP), 40 CFR Part 63, Subpart YYYY, Stationary Combustion Turbines. This regulation is available on the USEPA Website at [Stationary Combustion Turbines NESHAP](#). This regulation should be consulted carefully to determine applicability to your process.
- 5. Acid Rain Provisions of Title IV of the federal Clean Air Act, 40 CFR Part 72.

## C. Control Technology Analysis

- 1. Describe the emission control equipment for the turbines including both the expected and guaranteed efficiency (in percent) for each pollutant controlled.
- 2. For turbine(s) equipped with water or steam injection, provide the water or steam to fuel ratio, by weight, necessary to provide the control efficiencies at various ambient temperatures and relative humidities and describe the proposed monitoring and recording system for fuel consumption and the water/steam to fuel ratio.
- 3. Rule 702 BACT applies to all sources of VOCs proposed to be installed within the State of Michigan. A Rule 702 BACT analysis is very similar to a PSD top-down BACT analysis. Michigan's air pollution control rules also define BACT as an emission limit. Rule 702 BACT should be applied on a flexible grouping of equipment – subdivisions of emission units and/or groupings of emission units – if it is logical to do so. Logical means that the principles on which the groupings (or subdivisions) are made are consistent with federal guidance and sound engineering practices. Refer to "Instructions for Conducting a BACT Analysis" for additional detailed information.
- 4. Best Available Control Technology for Toxics (T-BACT) means the maximum degree of emission reduction which the Department determines is reasonably achievable for each process that emits toxic air contaminants (TACs) considering energy, environmental and economic impacts, and other costs. T-BACT does not apply to VOCs. The analysis must be specific to the process and the TACs subject to a T-BACT review. T-BACT limits can be expressed as an emission limit, control equipment requirements, and/or work practice standards. Refer to "Guidelines for Conducting a Rule 224 T-BACT Analysis" for additional detailed information.
- 5. Lowest achievable emission rate (LAER) applies to a major source and/or a major modification at a source located in a non-attainment area. Please see the [Attainment Status Map](#) on the [AQD website](#) for the current nonattainment status in Michigan. LAER is defined as the lowest emission limitation contained in any State Implementation Plan (SIP) or the lowest emission limitation achieved in practice. Such an emission limit is presumed to be LAER for that source class and category. If an applicant proposes to meet this presumptive LAER, no site-specific control technology determination will be necessary. When an applicant believes the presumptive LAER limit is not achievable, a site-specific determination is required. This determination should include consideration of raw material changes, process changes, and add-on control equipment. The cost of these changes is not considered. Raw material and process changes should be evaluated through technology transfer (i.e., the likelihood that such a change will transfer from one industry to another), based on the manufacture of similar products or use of similar raw materials or fuels. Add-on controls should be evaluated based on the physical and chemical characteristics of the pollutant-bearing exhaust stream.
- 6. PSD Top-down BACT applies to a major source and/or a major modification at a source of any regulated New Source Review pollutant located in an attainment area. The Clean Air Act defines BACT as "an emission limitation based on the maximum degree of reduction for each pollutant." BACT should be applied to a flexible grouping of equipment – subdivisions of emission units and/or groupings of emission units – if it is logical to do so. Logical means that the principles on which the groupings (or subdivisions) are made are consistent with federal guidance and sound engineering practices. Refer to Chapter 7 of the [AQD's PSD Workbook](#) for additional detailed information.

## D. Emissions Summary and Calculations

1. Estimate the maximum and expected uncontrolled and controlled emission rates and estimated emissions during startup and shutdown of each of the following pollutants, in pounds per hour and tons per year, from the firing of each fuel at various ambient temperatures (-20°F, 0°F, 30°F, 50°F, 60°F, and 100°F). Provide all assumptions, calculations, stack tests, and other documentation used to derive these values. These calculations should be done for both the turbine and duct burners if the proposal is for a combined cycle unit.
  - a) Particulate matter as total suspended particulate
  - b) Particulate matter as PM<sub>10</sub> (particulate diameter less than 10 microns)
  - c) Particulate matter as PM<sub>2.5</sub> (particulate diameter less than 2.5 microns)
  - d) Sulfur dioxide (SO<sub>2</sub>)
  - e) Nitrogen oxides, expressed as NO<sub>2</sub>
  - f) Carbon monoxide (CO)
  - g) VOCs, including formaldehyde
  - h) HAPs
  - i) Mercury
2. For nitrogen oxides and carbon monoxide from the turbines, also provide the emission rates expressed in parts per million (ppm), corrected to 15% oxygen, on a dry gas basis. Include a curve of emission rate versus ambient temperature, and emission rate versus power output.

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